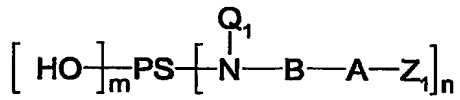
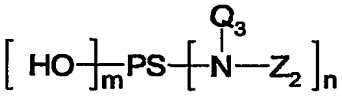
Claims

1. A reactive polysaccharide derivative of formula



(1a) or



(1b),

in which

A is -O-, -S- or  ,

Q_1 is hydrogen, the radical —B—A—Z_1 , C_1-C_{10}aryl which is unsubstituted or substituted, C_1-C_{12}alkyl which may be interrupted by oxygen and is unsubstituted or substituted,
Q_2 and Q_3 are each independently of the other hydrogen, C_1-C_{10}aryl which is unsubstituted or substituted, C_1-C_{12}alkyl which may be interrupted by oxygen and is unsubstituted or substituted,
B is an aliphatic or aromatic bridge member,
Z_1 and Z_2 are each independently of the other a reactive radical of the vinylsulfonyl series, the haloacryloyl series or the heterocyclic series,
PS is a polysaccharide radical,
m is 0, 1 or an integer greater than 1,
n is 1 or an integer greater than 1, and
the sum of n+m corresponds to the original number of hydroxy groups in the polysaccharide molecule.

2. A reactive polysaccharide derivative according to claim 1, wherein
Q_1 is hydrogen, benzyl and C_1-C_4alkyl which is unsubstituted or substituted by amino, or the radical —B—A—Z_1 , and Q_2 and Q_3 are each independently of the other hydrogen, benzyl and C_1-C_4alkyl.

3. A reactive polysaccharide derivative according to claim 1 or 2, wherein

A is  .

4. A reactive polysaccharide derivative according to any one of claims 1 to 3, wherein B is a C_2-C_{12}alkylene radical, which is unsubstituted or substituted by hydroxy, sulfo, sulfato, cyano or carboxy, and which may be interrupted by 1, 2 or 3 members from the group $-N(R_{1a})-$ and -O-, in which R_{1a} is hydrogen or C_1-C_4alkyl, or R_{1a} has the meaning indicated for Z_1 according to claim 1.

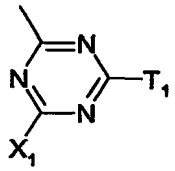
5. A reactive polysaccharide derivative according to any one of claims 1 to 4, wherein B is 1,2-ethylene, 1,3-propylene or 1,2-propylene.

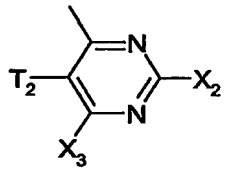
6. A reactive polysaccharide derivative according to any one of claims 1 to 5, wherein Z_1 is a radical of formula (2a), (2b), (2c), (2d) or (2e)

$-CO-(CH_2)_l-SO_2-Y$ (2a),

$-CO-CH(Hal)-CH_2-Hal$ (2b),

$-CO-C(Hal)=CH_2$ (2c),

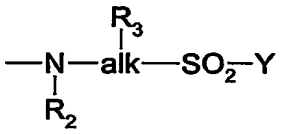
 (2d) or

 (2e)

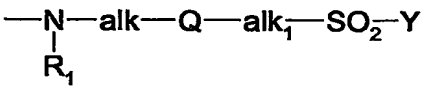
in which

Hal is chlorine or bromine,

X_1 is halogen, pyridinium, 3-carboxypyridin-1-yl or 3-carbamoylpyridin-1-yl, or a reactive radical of formula (3a), (3b), (3c), (3d), (3e) or (3f)

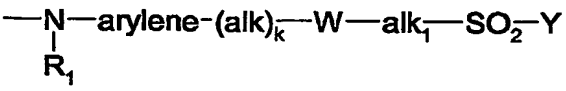


(3a),

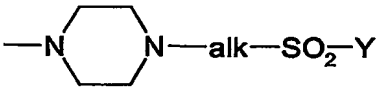


(3b),

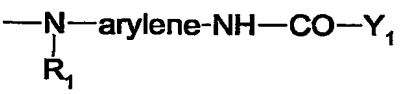
(3c),



(3d),



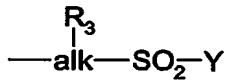
(3e) or



(3f),

in which

R_1 is hydrogen or C_1-C_4alkyl,

R_2 is hydrogen, C_1-C_4alkyl unsubstituted or substituted by hydroxy, sulfo, sulfato, carboxy or by cyano, or a radical  ,

R_3 is hydrogen, hydroxy, sulfo, sulfato, carboxy, cyano, halogen, C_1-C_4alkoxycarbonyl, C_1-C_4alkanoyloxy, carbamoyl or a group $-SO_2-Y$,

alk and alk_1 are each independently of the other linear or branched C_1-C_6alkylene,

arylene is a phenylene or naphthylene radical unsubstituted or substituted by sulfo, carboxy, C_1-C_4alkyl, C_1-C_4alkoxy or by halogen,

Q is a radical -O- or $-NR_1-$ wherein R_1 is as defined above,

W is a group $-SO_2-NR_2-$, $-CONR_2-$ or $-NR_2CO-$ wherein R_2 is as defined above,

Y is vinyl or a radical $-CH_2-CH_2-U$ and U is a group removable under alkaline conditions,

Y_1 is a group $-CH(Hal)-CH_2-Hal$ or $-C(Hal)=CH_2$ and Hal is chlorine or bromine, and

l is an integer from 1 to 6 and k is a number 0 or 1, and

X_2 is halogen or C_1-C_4alkylsulfonyl,

X_3 is halogen or C_1-C_4alkyl,

T_1 has independently the same definitions as X_1 above, or is a non-reactive substituent, and

T_2 is hydrogen, cyano or halogen.

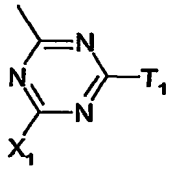
7. A reactive polysaccharide derivative according to any one of claims 1 to 6, wherein

Z_1 is a radical of formula (2a), (2b), (2c) or (2d)

$$-CO-(CH_2)_l-SO_2-Y \quad (2a),$$

$$-CO-CH(Hal)-CH_2-Hal \quad (2b),$$

$$-CO-C(Hal)=CH_2 \quad (2c) \text{ or}$$



(2d),

in which

Y is vinyl, β-chloroethyl or β-sulfatoethyl,

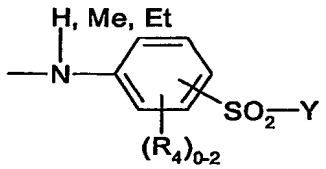
Hal is bromine, l is a number 2 or 3,

X_1 is halogen,

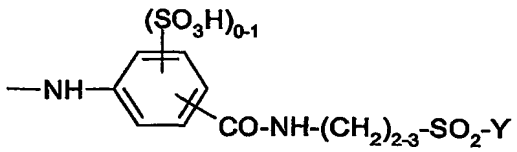
T_1 is C_1-C_4alkoxy, C_1-C_4alkylthio, hydroxy, amino, N-mono- or N,N-di-C_1-C_4alkylamino unsubstituted or substituted in the alkyl moiety by hydroxy, sulfato or by sulfo, morpholino, or phenylamino or N-C_1-C_4alkyl-N-phenylamino each unsubstituted or substituted in the phenyl ring by sulfo, carboxy, acetylamino, chlorine, methyl or by methoxy and wherein the alkyl is unsubstituted or substituted by hydroxy, sulfo or by sulfato, or naphthylamino unsubstituted or substituted by from 1 to 3 sulfo groups, or is a fibre-reactive radical of formula (3a'), (3b'), (3c'), (3d') or (3f')

$$-NH-(CH_2)_{2-3}-SO_2Y \quad (3a'),$$

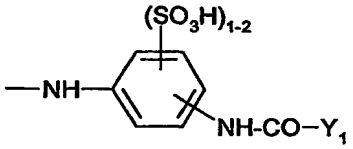
$$-NH-(CH_2)_{2-3}-O-(CH_2)_{2-3}-SO_2Y \quad (3b'),$$



(3c'),



(3d') or



(3f'),

in which

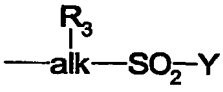
$(R_4)_{0-2}$ is 0 to 2 identical or different substituents from the group of methyl, methoxy and sulfo,

Y is as defined above, and

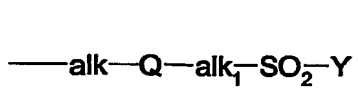
Y_1 is a group -CH(Br)-CH_2-Br or -C(Br)=CH_2.

8. A reactive polysaccharide derivative according to claim 1 or 2, wherein

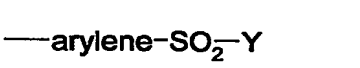
Z_2 is a radical of formula (4a), (4b), (4c), (4d), (4e) or (4f)



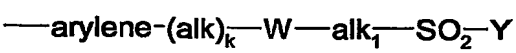
(4a),



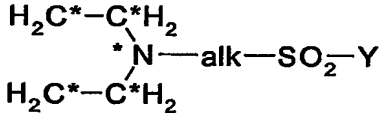
(4b),



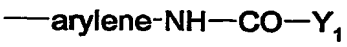
(4c),



(4d),



(4e) or



(4f),

in which

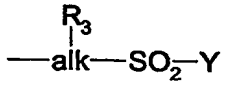
R_3 is hydrogen, hydroxy, sulfo, sulfato, carboxy, cyano, halogen, C_1-C_4alkoxycarbonyl, C_1-C_4alkanoyloxy, carbamoyl or a group -SO_2-Y,

alk and alk_1 are each independently of the other linear or branched C_1-C_6alkylene,

arylene is a phenylene or naphthylene radical unsubstituted or substituted by sulfo, carboxy, C_1-C_4alkyl, C_1-C_4alkoxy or by halogen,

Q is a radical -O-,

W is a group $-SO_2-NR_2-$, $-CONR_2-$ or $-NR_2CO-$ wherein R_2 is hydrogen, C_1-C_4alkyl unsubstituted or substituted by hydroxy, sulfo, sulfato, carboxy or by cyano, or a radical



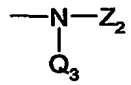
and R_3 is hydrogen, hydroxy, sulfo, sulfato, carboxy, cyano, halogen, C_1-C_4alkoxycarbonyl, C_1-C_4alkanoyloxy, carbamoyl or a group $-SO_2-Y$,

Y is vinyl or a radical $-CH_2-CH_2-U$ and U is a group removable under alkaline conditions,

Y_1 is a group $-CH(Hal)-CH_2-Hal$ or $-C(Hal)=CH_2$ and Hal is chlorine or bromine, and

and k is a number 0 or 1, and

the atoms indicated with an asterisk in the reactive radical of formula (4e) together with the radical of formula



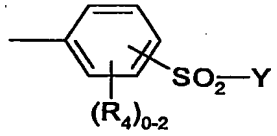
form a piperazine ring.

9. A reactive polysaccharide derivative according to claim 1, 2 or 8, wherein

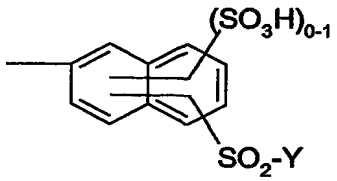
Z_2 is a radical of formula (4a'), (4b'), (4c'), (4c*), (4d'), (4d*) or (4f')

$-(CH_2)_{2-3}-SO_2Y$ (4a'),

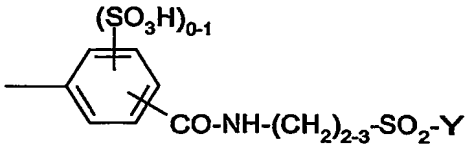
$-(CH_2)_{2-3}-O-(CH_2)_{2-3}-SO_2Y$ (4b'),



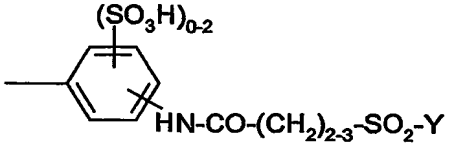
(4c'),



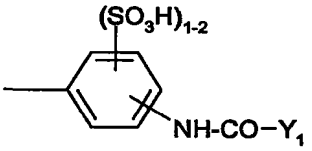
(4c*),



(4d'),



(4d*) or



(4f'),

in which

$(R_4)_{0-2}$ is 0 to 2 identical or different substituents from the group of methyl, methoxy and sulfo,

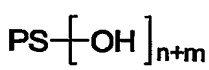
Y is vinyl, β-chloroethyl or β-sulfatoethyl, and

Y_1 is a group -CH(Br)-CH_2-Br or -C(Br)=CH_2.

10. A reactive polysaccharide derivative according to any one of claims 1 to 9, wherein n is 1 or 2, especially 1.

11. A process for the preparation of a reactive polysaccharide derivative of formula (1a) or (1b), which process comprises the steps of

(i) introducing at least one leaving group into the polysaccharide molecule by reaction of a polysaccharide compound of the formula

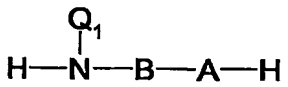


(4)

with at least n molar equivalents of a leaving group precursor P* to yield the compound of formula

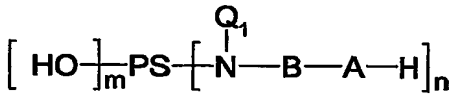
(5);

(ii) reacting the compound of formula (5) with at least n molar equivalents of the compound of the formula



(6)

to yield the compound of formula

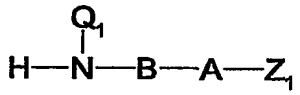


(7),

and allowing the compound of the formula (7) to react with at least n molar equivalents of the compound of the formula

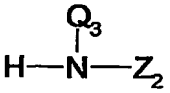
Z_1-X (8), or

reacting the compound of formula (5) with at least n molar equivalents of the compound of the formula



(9), or

reacting the compound of formula (5) with at least n molar equivalents of the compound of the formula



(10),

wherein

PS, Q_1, Q_3, A, B, Z_1, Z_2, m and n are as defined in claim 1, and X and P are a leaving group.

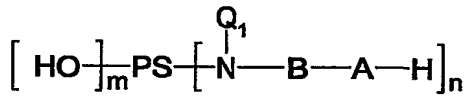
12. A process according to claim 11, wherein
the compound of formula (4) corresponds to cyclodextrin or a cyclodextrin derivative.

13. A process for the preparation of compounds or substrates modified with polysaccharides comprising reacting the said compounds or substrates with a polysaccharide derivative according to any one of claims 1 to 10 or a polysaccharide derivative obtained according to claim 11 or 12.

14. A process according to claim 13, wherein textile fiber materials containing hydroxy groups or containing nitrogen are finished with the polysaccharide derivative according to any one of claims 1 to 10 or a polysaccharide derivative obtained according to claim 11 or 12.

15. A process according to claim 14, wherein the textile fiber materials are cellulose containing fiber materials, in particular cotton containing fiber materials.

16. A compound of formula



(7),

wherein PS, Q_1, A, B, m and n are as defined in claim 1,
with the exception of β-cyclodextrin which is substituted in the 6-position of one of the D-glucopyranosyl units by 2-aminoethylenamino or 2-hydroxyethylenamino and γ-cyclodextrin which is substituted in the 6-position of one of the D-glucopyranosyl units by 2-aminoethylenamino.